REMARKS/ARGUMENTS

Applicants again appreciate the Examiner's indication that claims 8-10, 15, 17, 18, 21, 23, 24, 31-34, 38-41, 44-46 and 49-59 are allowed. Applicants request reconsideration and allowance in view of these further amendments and comments.

Regarding the Drawing Corrections

The Examiner has objected to the drawings because they don't show tapered waveguides as recited in claims 29-30. The Examiner has also objected to the drawings because he alleges the previously submitted corrections allegedly contain new matter.

In the 8/8/05 Office Action, the USPTO objected to the drawings because, he alleged, they did not show the "band-pass, band-blocking, reflection band-pass and reflection band-blocking filters of claims 11-14." In fact, original figures 7 and 8 show filters that can be designed to provide these characteristics. See paragraphs 93 and following. Nevertheless, for sake of completeness, applicants endeavored to submit new prior art figures 15-18 showing purely conventional passbands for each of these well-known filter types as would be understood by those of ordinary skill in the art. Applicants do not believe such new diagrams are in any way necessary to provide an adequate written description or enabling disclosure of claims 11-14, nor did the USPTO contend otherwise. The USPTO simply contended that USPTO Rule 83 requires the drawings to "show every feature of the invention specified in the claims." Should the Examiner believe that proposed new Figures 15-18 add "new matter", then applicants

request guidance from the Examiner on what type of additions to the drawings he may suggest that do not add new matter and yet show the feature the Examiner would like to have shown in the drawings. Once again, applicants respectfully contend that the originally filed drawings already show structures that provide the claimed passband characteristics.

In that same 8/8/05 Office Action, the USPTO objected to the drawing because it alleged they failed to show "the modulated sections separated by unmodulated sections as in claim 26 for example, the spacing resulting in 180 degree phase shift in claim 27." In response to that objection, the applicant submitted new Figure 19. Comparing for example Figures 8 and 9b with proposed new Figure 19, one can see that no "new matter" is being entered since the only difference is that Figure 19 shows precisely what original claim 26 recited, i.e., waveguides having "more than one length segment of contiguous modulations along their depth separated by unmodulated segments". If the Examiner contends that proposed new Figure 19 shows "new matter", applicants respectfully request the Examiner to indicate what features of proposed new Figure 19 are alleged to be "new matter" so applicant can submit a revised drawing that the Examiner finds to be acceptable.

Similarly, in that same 8/8/05 Office Action, the USPTO objected to the drawings because they allegedly did not show "length segments of different periods or modulation" as recited in originally filed claim 28. In response to that objection, applicants filed proposed new Figure 20 showing waveguides with different length segments of

modulation of different periods and/or structures of modulation" as recited in originally filed claim 28. Proposed new Figure 20 is substantially identical in content to original drawings such as original Figures 8 and 9b except for the different spacings (periods) between the top three modulations relative to the bottom three modulations. Should the Examiner contend that proposed new Figure 20 adds "new matter", applicants request the Examiner to specify exactly which features in the drawing he alleges are "new matter" so applicants can take corrective action.

Also in that same 8/8/05 Office Action, the USPTO objected to the drawings as failing to show tapered waveguides as recited in original claims 29-30. The Examiner has repeated this same objection in the current Office Action. However, applicants previously submitted proposed new Figure 21 that shows at least one end tapered as recited for example in original claim 29. Comparing proposed new Figure 21 to original Figure 8, it is difficult for applicant to understand exactly what in Figure 21 the Examiner contends is "new matter". If the Examiner has a specific objection, applicants request the Examiner to state it so they can take corrective action.

Finally, in that same 8/8/05 Office Action, the Examiner objected to the drawings because they did not show "a detector means as in claim 60." Applicants previously submitted a new proposed Figure 14a that is identical to Figure 14 except that it schematically showed a detector on the right-hand side. Applicants now submit a Substitute Figure 14a that simply shows a block labeled "detector."

Note that Figure 4b as originally filed already shows "antireflective structure coating surface of wafer such that at least some waveguide length is left uncoated" as recited in claim 35. See paragraph 66 for example.

For purposes of clarity, applicants now submit a complete set of proposed substitute drawings. Once gain, if the Examiner continues to believe the amended drawings contain "new matter", applicants request the Examiner to specifically point out which features are alleged to be "new matter" so the Examiner can consider and respond to the Examiner's position.

Regarding the Specification

The Examiner has objected to the specification because the newly submitted paragraphs were not underlined as required by Rule 530(d)(1). However, Rule 530(d)(1) applies only to reexamination proceedings. This is not a reexamination proceeding.

Regarding the Claim Rejections under 35 USC 103

The Examiner stated in the last office action with respect to rejected claims 1-7, 11-14, 16, 19, 20, 22, 25-28, 35-37, 42-43, 47, 60 and 61 that:

> Applicant also argues (pages 24-27) that the mode structure of applicant is different than that of Scherer. Examiner agrees with applicant however, responds that first Scherer has many embodiments that discusses waveguides propagation mode/modes field(s), nevertheless, the applicant needs to narrow appropriately the claimed limitations(s) in order to distinguish its [sic; their] teachings with [sic; from] that of the Prior Art teachings.

Following the Examiner's suggestion, applicants propose to amend each of the rejected independent claims to more particularly point out the claimed subject matter. Specifically, applicants have amended each of these currently-rejected independent claims to require that the spectral filter is "passive", to further require the waveguide array to comprise "substantially mutually decoupled and thus independent waveguides", and to further define the spectral filter as "passively, spectrally filtering light as said light propagates through said at least one waveguide mode." Note that applicants are making no amendments and are submitting no additional arguments with respect to the claims the Examiner has indicated are allowable over the prior art of record. The following arguments address why rejected claims 1-7, 11-14, 16, 19, 20, 22, 25-28, 35-37, 42-43, 47, 60 and 61 as amended are patentable over the applied references.

Applicants in their last response contended that Scherer did not teach filtering. The Examiner disagreed, stating in the last Office Action "that such limitation is at least shown in Fig. 11 and see its relevant parag." However, applicants respectfully submit that Scherer is describing the ***emission*** (or luminescence) spectrum, which is modified by a photonic bandgap structure. In contrast, the rejected claims as amended each now recite a passive device that ***filters*** a transmission spectrum.

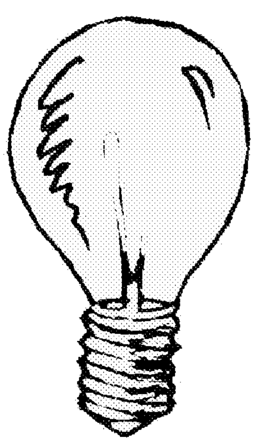
The entirety of Scherer's paragraph relating to his Figure 11 (which the Examiner refers to) is set forth below with emphasis added:

> Spectra from single defect cavities have also been obtained by optical pumping. When the photonic bandgap lattice parameter is tuned to the emission wavelength of the InGaAsP active material, and a perfect photonic crystal

> membrane is defined by ion etching, very little luminescence is observed to emit from the patterned membrane. However, once a defect is introduced into such a photonic crystal membrane, a peak can be observed in the **luminescence** spectrum **emitted** from the PBG structure. This peak occurs at the wavelength expected for the cavity resonance, and can be tuned by changing the lattice parameter of the photonic crystal. As the lattice parameter is changed, the peak position is correspondingly shifted proportionally to the change. FIG. 11 summarizes the tuning of a two dimensional Fabry-Perot filtered **emission** peak. In this series of spectra, the lattice parameter of the photonic crystal and the defect are systematically changed through microfabrication. For all lattice parameters, a defect mode is supported within the **gain** peak of the quantum wells.

Note the underlined indications in the paragraph above emphasizes the type of emission process occurring in Scherer.

The Examiner is presumably focusing on Scherer's use of the term "filtered emission peak" to support his contention that Scherer's device is a filter or acts as a filter. Note, however, that Scherer's optical device is actually an active device. An active device employs emission or some other process which – just like a light bulb -- causes generation of light that is not present prior to the active device being powered up:



Thus, Scherer must have either emission or amplification, or appearance of light with wavelengths that were not previously present in the beam, such as in nonlinear optical devices.

Passive filtering devices, in contrast, "shape" already existing light without providing any new "matter" to it. For example, passive filters can absorb, reflect or transmit wavelengths already present in the incident beam, but cannot provide any additional light, originally not present in the beam. The following is a simple example of a passive filter:

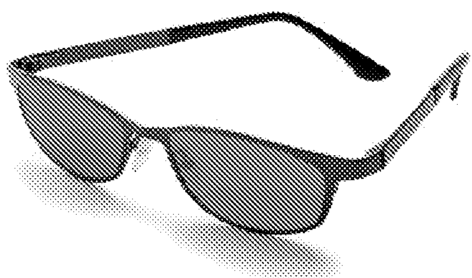
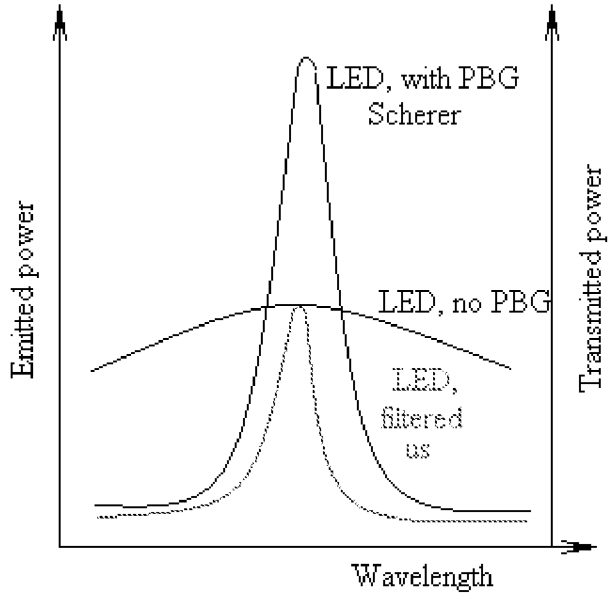


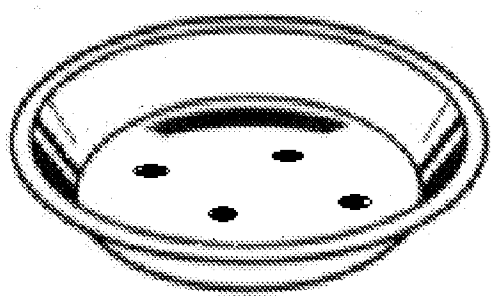
Figure 1 below illustrates this difference in more technical detail by schematically showing the spectral distribution of the emitted power by an LED (light emitted diode) without PBG (photonic band gap) and no filtering, with PBG (as in Scherer case) and LED emission filtered by applicant's illustrative non-limiting example filter.



Schematic drawing, illustrating the difference between active "filtering", or emission shaping (as in Scherer patent) and passive filtering.

Typically, an LED spectrum is quite a broad. If an LED is realized according to Scherer specification, the emission of the LED becomes much more narrow and the emission power within this narrow emission band is increased as compared to the LED without the PBG. This is presumably the reason why Scherer and other researchers are developing PBG LEDs and other active optical components. The reason for this is that photonic bandgap structures effectively prohibit the emission of light outside the wavelength corresponding to the cavity resonance, and thus provide higher emission rates into the cavity mode.

In layman's terms, Scherer's process is similar to the case of a pan full of water (LED structure under pumping) with several holes at the bottom (emission channels). If all the holes but one are plugged (PBG is created in an active layer), more water will drain through the unplugged hole (PBG cavity mode).



In contrast, in a passive filter context, parts of the incident spectrum will not be allowed to pass, so the passed spectrum will be more narrow, or shaped, but the amplitude can never be greater at any wavelength. Also, Scherer clearly teaches the necessity of gain in the medium. Of course, no gain is available in a passive filter context.

Applicant's passive spectral filter could of course be coupled to and used in connection with an active device such as one that emits light. However, it is apparent that Scherer's device would not function in a passive mode. This is a significant difference that distinguishes applicant's claimed subject matter from Scherer.

The Examiner further states: "Applicant alleges (page 25 and 28) that Scherer does not teach surfaces. Examiner responds that such limitations are clearly shown in at least fig. 1 and 23 with having edge side surfaces along top and bottom surfaces."

Applicant was unable to find any reference to Fig. 23 in Scherer (Scherer's patent appears to have just 21 Figures). Most probably it was a simple typographical error, but since applicants are not clear what particular Figure Examiner referenced in this regard, applicants will limit its analysis to Scherer's Fig. 1 (a-d). To refresh the Examiner's

memory, the issue is whether one of ordinary skill in the art would consider the upper and lower sides of the Scherer structure (illustrated in Fig. 1) as surfaces, or left and right edges as surfaces.

In his patent, Scherer clearly calls upper and lower sides “surfaces” (see claims 2, 26, 51, Fig. 21 and relevant parag., etc.). However, applicants cannot find any portions of Scherer that support the Examiner's contention that other portions are "surfaces."

The Examiner further asserts:

> Applicant asserts (page 24 and 27) that Scherer does not describe plural, parallel or uncoupled waveguides. Examiner responds that such limitations discussed in at least abstract and in col. 7, 3rd parag. that are related to figures 1-7 in which waveguides are constructed along cavities to transmit light onto elements associated with/within the crystal substrate/wafer.

The cited passage from Scherer patent follows (emphasis added):

> As stated above, it is possible and desirable to construct many optical cavities and waveguides within a perforated slab, and to **connect** these so that the light has to interact with these photonic crystal components to form a photonic circuit. This requires control over the emission direction into and out of the optical cavities, which will serve as laser sources, filters, or modulators. In a perfectly symmetrical optical cavity 36, lasing can occur in one of the three symmetric directions, and would randomly choose the preferred direction. When we deliberately change, through lithography, the symmetry, we can predict the direction of emission and it is possible then to design the optical circuit around that known emission direction. An example is shown in FIG. 3, where light emission is preferred in the vertical direction out of the plane of the Figure, since the holes next to the photonic crystals are slightly enlarged in the horizontal direction.

Note the emphasized words "to connect these …". It is obvious that Scherer suggests to connect (or, in other terminology, couple) waveguides. In contrast, the rejected independent claims herein as amended specifically require "uncoupled … waveguides". There is also no mention of parallel uncoupled waveguides in Scherer. In addition, the waveguides in Scherer's case are in the plane of the wafer perpendicular to holes, while the rejected amended claims herein require the waveguides to be perpendicular to the wafer plane and parallel to the holes.

All outstanding issues have been addressed and this application is in condition for allowance. Should any minor issues remain outstanding, the Examiner should contact the undersigned at the telephone number listed below so they can be resolved expeditiously without need of a further written action.

Respectfully submitted,

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